

Ten New Species and Two New Combinations of *Blechnum* (Blechnaceae, Pteridophyta) from Bolivia

MICHAEL KESSLER

Albrecht-von-Haller-Institut für Pflanzenwissenschaften, Abteilung für Systematische Botanik,
Untere Karspüle 2, D-37073 Göttingen, Germany

ALAN R. SMITH

University Herbarium, 1001 Valley Life Sciences Bldg., #2465, University of California, Berkeley,
CA 94720-2465

MARCUS LEHNERT

Albrecht-von-Haller-Institut für Pflanzenwissenschaften, Abteilung für Systematische Botanik,
Untere Karspüle 2, D-37073 Göttingen, Germany

ABSTRACT.—We describe ten new species of *Blechnum* (Blechnaceae, Pteridophyta) from Bolivia and provide a key to the Bolivian species of the genus. The new species are: *B. bicolor*, *B. bolivianum*, *B. bruneum*, *B. cochabambense*, *B. pazense*, *B. reflexum*, *B. repens*, *B. smilodon*, *B. squamatum*, and *B. vallegrandense*. *Blechnum gracilipes* and *B. squamipes* are elevated to species rank.

Blechnum (Blechnaceae) has about 150–200 recognized species but is still taxonomically very incompletely known, especially in the Andes. During our studies of the genus for a forthcoming guide to the ferns of Bolivia, we have encountered ten unnamed species that are here described.

Most of the species named here belong to sect. *Parablechnum* (C. Presl) T. Moore, one of the morphologically most distinctive species groups in *Blechnum*. This section is characterized by dimorphic leaves, usually erect or suberect rhizomes, ovate to ovate-lanceolate rhizome and petiole base scales, these bicolorous or concolorous and one cell thick near their apices, and a chromosome base number of $x = 28$. Section *Parablechnum* is also highly supported in molecular studies and perhaps should be treated as a distinct genus (Cranfill, 2001). The distinctiveness of the section contrasts with the difficulty in distinguishing the included species. This is partly due to the lack of monographic studies on the section and partly the result of poorly defined species boundaries and possible hybridization.

Blechnum bicolor M. Kessler *et* A.R. Sm., *sp. nov.* TYPE.—Bolivia. **La Paz:** Prov. Nor Yungas, Unduavi, 3400 m, November 1910, *Buchtien 2690* (holotype: UC). **Fig. 1, A–C.**

Species ex grege *Parablechnuo* rhizomatibus brevibus erectis, squamis rhizomatum bicoloris cellulorum elongatorum translucientiumque, squamis costalibus bicoloribus, pinnis coriaceis marginalium parce reflexarum.

Terrestrial; rhizomes stout, erect, ca. 3 cm in diameter including petiole bases, scales 6–10 × 1–2.2 mm, lanceolate, translucent, reddish brown to

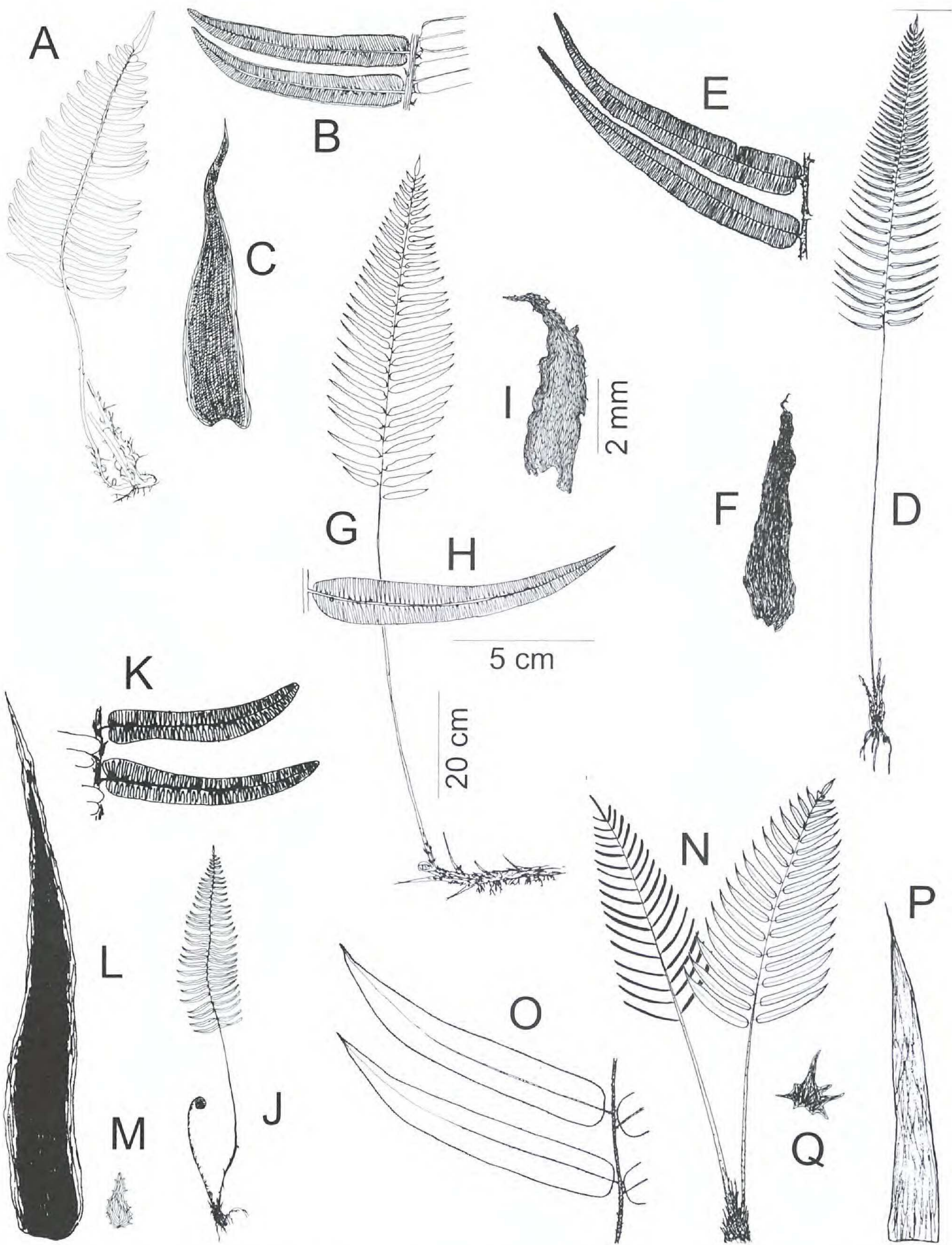


FIG. 1. *Blechnum bicolor*: A. Habit, B. Median pinnae, C. Rhizome scale. *Blechnum bolivianum*: D. Habit, E. Median pinnae, F. Rhizome scale. *Blechnum pazense*: G. Habit, H. Median pinna, I. Rhizome scale. *Blechnum cochabambense*: J. Habit, K. Median pinnae, L. Rhizome scale, M. Costal scale. *Blechnum squamatum*: N. Habit, O. Median pinnae, P. Rhizome scale, Q. Costal scale. The drawings of habit, pinnae, and scales, respectively, are to the same scale for all species.

blackish with narrow, sharply defined pale margins, cells elongate, margins entire; sterile leaves to 90×15 cm, erect; petioles to 45 cm long and 3 mm thick, reddish brown to distally stramineous, moderately scaly (but scales often abraded), scales basally similar to those of the rhizomes but soon grading into a mixture of two types of smaller, paler scales, one $2\text{--}10 \times 0.2\text{--}2$ mm, lanceolate, spreading, translucent, yellowish brown, entire or sparsely denticulate, the other $0.1\text{--}0.8 \times 0.1\text{--}0.7$ mm, roughly ovate, appressed, yellowish brown, ciliate; sterile laminae broadly lanceolate, 1-pinnate with an abruptly reduced base and gradually reduced apex with a conform apical pinna; pinnae ca. 15–28 pairs, to 9×1 cm, oriented at roughly 90° to the rachises or slightly ascending, the longest pinnae located in the proximal third of the laminae, the lowermost pinnae ca 90% as long as the longest ones, pinnae petiolulate (0.5–2 mm), falcate, apices acuminate, margins narrowly hyaline, finely serrulate, reddish brown with slightly paler marginal areas; laminar tissue rigidly chartaceous, drying to a similar pale olive green on both sides, adaxially glabrous, abaxially with scattered, tiny scales on the veins, the scales $0.05\text{--}0.2 \times 0.05 \times 0.2$ mm, arachnoid, appressed, pale brown; veins simple or 1-forked, slightly immersed on both sides, ending in small hydathodes; fertile fronds similar to the sterile ones, but pinnae narrower, 3–5 mm wide; sori limited to the central part of the pinnae, i.e., lacking in the proximal 5–10 mm and the distal 10–20 mm; indusia dark, entire to erose at maturity.

PARATYPES.—Bolivia. **Cochabamba:** Prov. Ayopaya, Comunidad Pampa Grande, entre Achira y Pampa Grande, zona de pastoreo, $16^\circ 40' S$, $66^\circ 28' W$, 2130 m, 09 November 2002, *Jimenez 1552* (GOET, LPB, UC). **La Paz:** Prov. F. Tamayo, PN-ANMI Madidi, senda Keara-Mojos, abajo de Chunkani, $14^\circ 38' S$, $68^\circ 57' W$, 2910 m, 11 August 2001, *Jimenez 942* (LPB); Prov. Nor Yungas, Estación Biológica de Tunquini, Bajo Hornuni, senda del campo de Don Pedro al camino de la mina, $16^\circ 12' S$, $67^\circ 53' W$, 2300 m, 25 July 2000, *García 4479* (GOET, LPB, UC); Prov. Nor Yungas, camino desde Unduavia a Chulumani, $16^\circ 18' S$, $67^\circ 52' W$, 3150 m, 22 December 1991, *Schmit 168* (LPB, UC); same general locality, 3115 m, 24 December 1991, *Schmit 170 pp* (LPB).

The epithet alludes to the bicolorous costal and rhizome scales.

This species forms a natural group with *B. bolivianum* and *B. pazense*, all of which are described here. Only in the last few years have enough new collections been made to allow the evaluation of the variability within the species and the consistency of the differentiating characters. As a group, they are perhaps most closely related to *B. cordatum* (Desv.) Hieron., which is a much larger species with paler, larger, concolorous rhizome scales. *Blechnum cordatum* is highly variable and probably comprises a species complex. A detailed study of this complex is needed to understand the impressive radiation it has undergone in the Bolivian Andes.

Blechnum bicolor is similar to *B. pazense* in having bicolorous costal scales and relatively thick-textured pinnae with slightly revolute margins, but differs by having less elongate rhizomes, bicolorous rhizome scales with translucent

cells, and stramineous costae and rachises. It is also similar to *B. bolivianum*, but the latter has concolorous costal scales, darker rhizome scales with shorter, occluded cells, and thinner-textured leaves.

On the type, Buchtien indicated that this species has a trunk up to 1 m tall, but this is probably due to confusion with one or both of two trunk-forming species of *Blechnum*, namely *B. loxense* (Kunth) Hook. ex Salomon and *B. auratum* (Fée) R. M. Tryon & Stolze, that co-occur with *B. bicolor* at the type locality. None of the additional specimens seen and no related species of *Parablechnum* have tall trunks. The type was studied by C. V. Morton in the late 1960s. On a note attached to the specimen he wrote that he was unable to name the specimen.

Blechnum bicolor is fairly common in humid montane forests at 2300–3400 m in Cotapata National Park, Bolivia. A specimen (*Jimenez 1552*) from Cochabamba, about 140 km east of the type locality may also belong with this species, but the rhizome and costal scales are less clearly bicolorous.

Blechnum bolivianum M. Kessler et A.R. Sm., *sp. nov.* TYPE.—Bolivia. **La Paz:** Prov. Nor Yungas, Estación Biológica de Tunquini, senda cafetal (cerca del campamento de Don Pedro) al camino de la mina, 16°12'S, 67°53'W, 2500 m, 8 March 2001, *Bach 1332* (holotype: UC; isotypes: GOET, LPB). **Fig. 1, D–F.**

Differt a *Blechno cordato* (Desv.) Hieron. squamis rhizomatis atrobrunneis cellulorum occlusorum, pinnibus angustioribus tenuioribusque, rhachidibus cum squamis densiore vestitis.

Terrestrial; rhizomes stout, erect, ca. 5 cm in diameter including petiole bases, scales 4–6 × 1.2–2.5 mm, ovate-lanceolate, dark brown to blackish with narrow, pale brown margins, cells small, elliptical, mostly occluded, margins entire, erose or with a few distinct teeth; fertile leaves unknown; sterile leaves to 120 × 26 cm, erect; petioles to 60 cm long and 4 mm thick, reddish brown to distally stramineous, moderately scaly (but scales often abraded), scales basally similar to those of the rhizomes but these soon grading into a mixture of two types of smaller, paler scales, one 1.5–4 × 0.5–1.2 mm, ovate to ovate-lanceolate, spreading to appressed, dull pale brown, finely denticulate, the other 0.3–1 × 0.2–0.8 mm, ovate, dense, appressed, dull pale brown, ciliate; sterile laminae narrowly deltate, 1-pinnate with a rather abruptly reduced base and gradually reduced apex with a conform apical pinna; pinnae ca. 25–30 pairs, to 14 cm × 16 mm, oriented at 80–90° to the rachises, the longest pinnae located in the proximal 1/3 of the laminae, the proximal pinnae ca. 85% as long as the longest ones, pinnae petiolulate (1–2 mm), slightly curved forward, apices long-acuminate, margins narrowly hyaline, finely serrulate, very slightly revolute; aerophores tuberculiform; rachises reddish brown to stramineous, adaxially grooved, moderately scaly, scales similar to those of petioles but slightly smaller; costae reddish brown to stramineous, adaxially grooved, glabrous, abaxially densely scaly, the scales appressed to the laminae, 0.5–1.2 × 0.3–0.8 mm, ovate-lanceolate, denticulate, pale brown; laminar

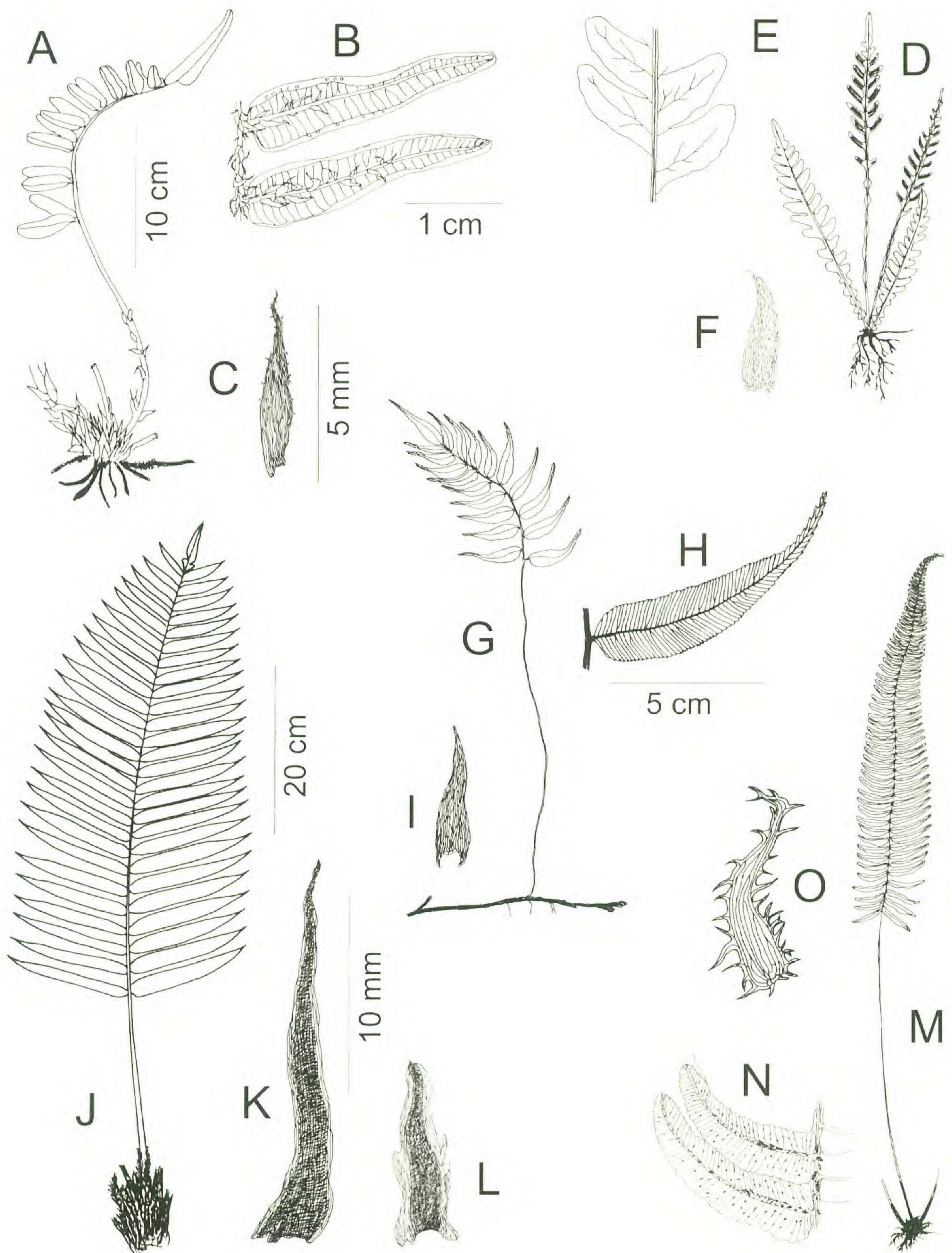


FIG. 2. *Blechnum reflexum*: A. Habit, B. Median pinnae, C. Proximal petiole scale. *Blechnum vallegrandense*: D. Habit, E. Median pinnae, F. Rhizome scale. *Blechnum repens*: G. Habit, H. Median pinna, I. Rhizome scale. *Blechnum bruneum*: J. Habit, K. Rhizome scale, L. Petiole scale. *Blechnum smilodon*: M. Habit, N. Median pinnae, O. Rachis scale. The drawings of habit, pinnae, and scales, respectively, are to the same scale for the upper two and lower three species.

tissue chartaceous, drying to a similar pale olive green on both sides, adaxially glabrous, abaxially with scattered, tiny scales on the veins, the scales $0.05\text{--}0.2 \times 0.05 \times 0.2$ mm, arachnoid, appressed, pale brown; veins simple or 1-forked, adaxially slightly immersed, abaxially slightly raised and slightly paler than the laminar tissue, ending in small hydathodes.

PARATYPES.—Bolivia. **Cochabamba:** Prov. Carrasco, km 10 desde Siberia a Comarapa, $17^{\circ}48'S$, $64^{\circ}42'W$, 2600 m, 20 October 1996, *Kessler 9166* (LPB, UC). **La Paz:** Prov. Nor Yungas, Estación Biológica de Tunquini, senda cafetal, al camino de la mina, $16^{\circ}12'S$, $67^{\circ}53'W$, 2400 m, 08 April 2001, *Bach 1404* (GOET, LPB); same general locality, 2400 m, 26 July 2000, *García 4459* (LPB).

This new species is perhaps most similar to *B. cordatum*, but differs by having dark brown rhizome scales with occluded cells, narrower, thinner-textured pinnae, and more abundant rachis scales. It is also similar to *B. pazense*, but that species has longer, more creeping rhizomes, paler reddish brown, finely denticulate rhizome scales, narrower, more lanceolate blade outlines, and at least some bicolorous costal scales.

Blechnum bolivianum is a fairly common species in humid montane forests at 2400–2600 m in the departments of La Paz and Cochabamba. It mostly occurs at lower elevations than *B. bicolor*.

Blechnum bruneum M. Kessler & A.R. Sm., *sp. nov.* TYPE.—Bolivia. **La Paz:** Prov. Bautista Saavedra, 12 km de Charazani hacia Apolo, $15^{\circ}11'S$, $68^{\circ}46'W$, 2500 m, 1 July 1997, *Kessler 10481* (holotype: UC; isotypes: GOET, LPB). **Fig. 2, J–L.**

Differt a *Blechnum brasiliense* Desv. squamis rhizomatis petiolorum basaliumque latioribus brunneisque (vs. nigribus), petiolis longioribus (17–33 cm vs. 2–12 cm), presentia squamorum rhachidi.

Terrestrial; rhizomes erect, densely scaly, scales $15\text{--}24 \times 1.5\text{--}2.5$ mm, linear to lanceolate, shiny, dull yellowish brown or with narrow dark red-brown centers, entire; fertile leaves unknown; sterile leaves to ca. 120 cm long, erect; petioles 17–33 cm long and to 7 mm in diameter, dark reddish brown, densely scaly at bases, sparsely scale distally, scales similar to those of rhizomes but smaller; sterile laminae to ca. 90×30 cm, lanceolate, pinnatisect, basally 1-pinnate, distally pinnatisect; sterile pinnae to ca. 60 pairs, to $15 \text{ cm} \times 16 \text{ mm}$, oriented at ca. 80° to the rachises, the longest pinnae about midblade, proximal pinnae gradually reduced with the lowermost pair to 1.7 cm long, linear-lanceolate, mostly broadly adnate (except the basalmost pinnae), bases somewhat unequal, apices acute, margins cartilagineous, serrulate, not revolute; aerophores absent; rachises dark reddish brown, grooved adaxially, sparsely scaly, the scales similar to those of the petioles but smaller, to 8×0.7 mm; costae stramineous, raised on both sides, glabrous; laminar tissue chartaceous, glabrous, drying olive green, slightly paler abaxially than adaxially; veins mostly 1-forked, impressed adaxially, raised abaxially, ending in small hydathodes.

PARATYPES.—Bolivia. **Cochabamba:** Prov. Carrasco, km 7 desde Siberia a Karahuasi, 17°48'S, 64°41'W, 2200 m, 16 October 1996, *Kessler 9094* (GOET, LPB); Prov. Chapare, Incachaca, 2200 m, 23 January 1929, *Steinbach 8914* (UC).

This species has gradually reduced proximal pinnae as well as lanceolate, brown rhizome and basal petiole scales (hence the species epithet). In laminar shape it closely resembles *B. brasiliense*, but that species and its close Old World relatives have narrower, entirely or mostly black rhizome scales. *Blechnum bruneum* further differs from *B. brasiliense* by having longer petioles (17–33 cm vs. 2–12 cm) and by bearing scattered scales on the rachises. *Blechnum bruneum* grows along streams and in swampy places in humid montane forests at 2200–2500 m and appears to replace *Blechnum brasiliense* (up to 1600 m) at higher elevations in the Bolivian Andes.

Blechnum cochabambense M. Kessler & A.R. Sm., *sp. nov.* TYPE.—Bolivia.

Cochabamba: Prov. Carrasco, Km 95–96 on old road between Cochabamba and Villa Tunari, 17°12.64'S, 65°41.95'W, 3400 m, 24 October 1999, *Ståhl 5156B* (holotype: AAU; isotypes: BOLV, S). **Fig. 1, K–M.**

Species ex sectione *Parablechno* rhizomatibus erectis squamas lanceolatas integres, 14–30 mm longas ferentibus, mixtura squamarum costalium partim ovatarum, spadicearum, ciliatarum, partim lanceolarum, brunnearum, integrum usque ad denticularum, pinnis coriaceis falcatis basaliter cordatis, venis adaxialiter immersis, squamis laminarum satis densis preastans.

Terrestrial; rhizomes erect, ca. 3–4 cm in diameter including petiole bases, scales 14–30 × 2–3 mm, linear-lanceolate, reddish brown with narrow paler margins, entire; leaves to 70 × 15 cm, erect to arching, fertile leaves unknown; petioles to 30 cm long and 5 mm thick, shiny red-brown, densely scaly, scales of two types, one similar to those of the rhizomes but smaller, basally erose, and deciduous except at petiole base, the other appressed, ovate to lanceolate, 1–3 × 0.3–1.5 mm, dull pale brown, erose-denticulate; laminae lanceolate, 1-pinnate with a gradually reduced apex and an elongate apical segment; pinnae 21–28 pairs, to 9 cm × 11 mm, oriented 90° to the rachis, the longest pinnae the 2nd or 3rd pair from the laminar base, proximal pinnae 80–90% the length of the longest pinnae, pinnae petiolulate (1–2 mm), falcate, bases cordate, apices acuminate, margins narrowly hyaline, serrulate, revolute; rachises red-brown to stramineous, grooved, densely scaly, scales of two types, one 1–3 × 0.3–0.6 mm, spreading, lanceolate, brown, entire to denticulate, the other 0.3–1 × 0.2–0.8 mm, loosely appressed, ovate, tan, erose to ciliate; aerophores at pinna bases tuberculiform, dark; costae adaxially stramineous, grooved, moderately scaly, the scales similar to those of the rachis but smaller, abaxially stramineous, densely scaly, the scales similar to the large rachis scales; blades coriaceous, drying pale olive green, slightly paler abaxially, adaxially sparsely scaly, the scales 0.1–0.7 × 0.1–0.5 mm, loosely appressed, ovate, tan, erose to ciliate, abaxially sparsely scaly, the scales 0.1–1 × 0.05 × 0.5 mm, loosely arranged, lanceolate, tan, ciliate; veins simple, adaxially

immersed in leaf tissue, abaxially slightly raised and slightly paler than the laminar tissue, ending in small hydathodes.

PARATYPE.—Bolivia. **Cochabamba:** Prov. Carrasco, Lope Mendoza, km 110 camino a Santa Cruz, 17°32'S, 65°22'W, 3110 m, 05 May 1995, *Fernández 521* (BOLV, LPB).

This species belongs to sect. *Parablechnum*. It is recognized by its erect rhizomes with bicolorous, lanceolate, entire rhizome scales 14–30 mm long; tan, denticulate costal scales, coriaceous, falcate, basally cordate pinnae with adaxially sunken veins; and rather dense blade scales. It is probably most closely related to *B. cordatum* s. lat., but that has concolorous, tan, translucent rhizome scales, whitish to pale tan, translucent, entire to erose costal scales, and broader, flat, thinner-textured pinnae. Other related species may be *Blechnum lima* Rosenst., which has similar coriaceous pinnae with sunken veins, but much larger, denticulate costal scales, and *B. squamatum* (which grows with *B. cochabambense*), which is larger overall and has broader, thinner-textured pinnae and much smaller rhizome scales.

Blechnum cochabambense is known from two collections in humid montane forests with *Weinmannia* or *Polylepis lanata* (Kuntze) M. Kessler & Schmidt-Leb. at 3100–3400 m in a limited area of Dept. Cochabamba (hence the species epithet).

Blechnum pazense M. Kessler & A.R. Sm., *sp. nov.* TYPE.—Bolivia. **La Paz:** Prov. Franz Tamayo, PN-ANMI Madidi, sendero Keara-Mojos, a 1 hora y media aproximadamente de caminata desde Tokuaque por la senda del inciensial, 14°36'S, 68°57'W, 2490 m, 11 March 2001, *Jimenez 752* (holotype: UC; isotype: LPB). **Fig. 1, G–I.**

Species ex sectione *Parablechno* rhizomatibus elongatis, prostratis usque ascendentibus, squamis rhizomatum uniforme atropurpureis denticulatisque, squamis costalibus fere 1 mm longis partimque bicoloribus preastans.

Terrestrial; rhizomes elongate, creeping to suberect, ca. 2–3 cm in diameter including petiole bases, scales 5–8 × 1.2–2 mm, lanceolate, dark reddish brown, denticulate; leaves to 175 × 21 cm, erect to arching, fertile and sterile leaves similar; petioles to 100 cm long and 5 mm thick, dark reddish brown, adaxially densely scaly, scales basally similar to those of the rhizomes but distally mixed with appressed, ovate to lanceolate, dull pale brown, denticulate scales 1–3.5 × 0.3–1 mm; laminae lanceolate, 1-pinnate, each with a gradually reduced apex; pinnae ca. 40 pairs, to 11 cm × 12.5 mm, oriented at 75–90° to the rachis, the longest pinnae medial, the proximal pinnae ca. 85% as long as the longest ones, pinnae petiolulate (1–3 mm), falcate, apices long-acuminate, margins hyaline, serrulate, slightly revolute; aerophores tuberculiform; rachises adaxially dull brown, grooved, glabrous, abaxially dark reddish brown to atropurpureous, densely scaly, scales 1–3 × 0.3–1 mm, appressed, ovate to lanceolate, pale brown, dull, denticulate; costae adaxially stramineous, grooved, glabrous, abaxially atropurpureous, bearing

dense scales, the scales appressed, $0.5\text{--}1 \times 0.3\text{--}0.7$ mm, ovate, entire to denticulate, pale brown to (at the base of the costae) bicolorous with dark brown centers and whitish margins; laminar tissue chartaceous, drying pale olive green on both sides, adaxially glabrous, abaxially with scattered, tiny scales mostly on the veins, the scales $0.05\text{--}0.2 \times 0.05 \times 0.2$ mm, arachnoid, appressed, pale brown; veins mostly 1-forked, some simple, adaxially immersed, abaxially slightly raised and slightly paler than the laminar tissue, ending in small hydathodes; sori linear, continuous, parallel to the costae, leaving 2–4 mm of green laminar tissue between the sori and pinna margins, usually not reaching the pinna apex; indusia to 1 mm wide, translucent, brown, entire to slightly erose.

PARATYPES.—Bolivia. **La Paz:** Prov. F. Tamayo, Apolo, Pinalito, $14^{\circ}31'S$, $68^{\circ}16'W$, 2200 m, 26 April 2003, *Cayola 365* (LPB); Prov. F. Tamayo, PN-ANMI Madidi, sendero Keara-Mojos, a 1 hora y media aproximadamente de caminata desde Tokuaque por la senda al inciensial, $14^{\circ}36'S$, $68^{\circ}57'W$, 2490 m, 11 March 2001, *Jimenez 751* (LPB, UC); Prov. F. Tamayo, PN-ANMI Madidi, senda Keara-Mojos, desde Tokuaque, antes de llegar a Chunkani, $14^{\circ}38'S$, $68^{\circ}57'W$, 2830 m, 11 October 2001, *Jimenez 1008* (GOET, LPB, UC); Prov. Nor Yungas, Estación Biológica de Tunquini, Bajo Hornuni, senda del campo de Dn Pedro al camino de la mina, $16^{\circ}12'S$, $67^{\circ}53'W$, 2400 m, 25 July 2000, *García 4460* (LPB, UC).

This species belongs to sect. *Parablechnum*. It is recognized by its elongate, creeping to suberect rhizomes, uniformly dark reddish brown, denticulate rhizome scales, and partly bicolorous costal scales about 1 mm long. It is most similar to *B. bolivianum*, which, however, has shorter, erect rhizomes, darker, entire, erose or spinulose rhizome scales, shorter and broader, basally more abruptly reduced laminae, and concolorous costal scales.

Blechnum pazense is fairly common locally in humid montane forests at 2400–2850 m in Dept. La Paz, where it co-occurs with *B. bicolor* and *B. bolivianum*.

Blechnum reflexum Rosenst. ex M. Kessler & A.R. Sm., *sp. nov.* TYPE.—

Bolivia. **Cochabamba:** Prov. Carrasco, Km 104 antigua carretera Cochabamba-Villa Tunari, $17^{\circ}11'S$, $65^{\circ}40'W$, 3250 m, 25 June 1996, *Kessler 6697a* (holotype: UC; isotype: LPB). **Fig. 2, A–C.**

Unicum in sectione *Parablechno* pinnis lateralibus ovato-lanceolatis distincte petiolulatis (1–2 mm) marginibusque forte reflexis

Terrestrial; rhizomes erect, ca. 1.5 cm in diameter including petiole bases, scales probably similar to those on the petiole bases (but not discernable on the small rhizomes available); fertile leaves unknown; sterile leaves to 33 cm long, arched; petioles to 18 cm long and 2.5 mm in diameter, slightly longer than the laminae, dark reddish brown, densely scaly at the bases with a few similar but smaller scattered scales distally, the scales $3\text{--}7 \times 0.6\text{--}2.2$ mm, lanceolate to oblong-lanceolate, spreading, flaccid, translucent, not shiny, light orangish

brown, with finely dentate margins; sterile laminae to 15×5 cm, lanceolate, 1-pinnate with a distinct, elongate apical pinna; sterile lateral pinnae to 15 pairs, to $2.6 \text{ cm} \times 5.5 \text{ mm}$, oriented at right angles to the rachis, strongly folded towards the adaxial rachis, the longest pinnae about $1/3$ from the base of the laminae, the proximal pinnae ca. 60–70% as long as the longest ones ovate-lanceolate, often with unequal bases, petiolules 1–2 mm long, apices rounded, margins slightly cartilaginous, paler, serrulate, and strongly revolute; apical pinna of each blade to $4.4 \text{ cm} \times 7 \text{ mm}$, triangular with an abruptly reduced, unequal base and acute apex; rachises dark reddish brown, grooved adaxially, densely scaly, the scales $1.5\text{--}5 \times 0.2\text{--}1.2$ mm, lanceolate to oblong-lanceolate, appressed to slightly spreading, flaccid, translucent, orangish brown, with finely dentate margins; costae pale brown, deeply sunken adaxially and strongly raised abaxially, moderately scaly, the scales similar to those on rachis but somewhat smaller and relatively broader; laminar tissue coriaceous, drying dark olive adaxially and paler brown abaxially, glabrous; veins mostly simple, rarely 1-forked, impressed on both sides, abaxially conspicuously darker than the laminar tissue, ending in small hydathodes.

PARATYPE.—Bolivia. **La Paz:** Prov. Nor Yungas, Unduavi, 3300 m, November 1910, *Buchtien 2681* (UC).

This distinctive species was recognized by Rosenstock as undescribed and annotated accordingly on the herbarium sheet now at UC. However, Rosenstock never published it. To date it is known from only two sterile collections. Therefore, the measurements given in the description may not reflect the potential size of this species. Nevertheless, we do not hesitate in describing it as new because it has unique, petiolulate, ovate-lanceolate, and strongly reflexed lateral pinnae (hence the species epithet) with strongly revolute margins. No other known species of *Parablechnum* has similarly reflexed pinnae. The pinnae are somewhat reminiscent of *Blechnum auratum*, but that species has very different, long, falcate, and shiny rhizome scales and belongs to sect. *Lomariocycas* (J. Sm.) C. V. Morton.

Blechnum reflexum is apparently a rare and local species that has been found on rock faces in humid habitats around the present timberline at 3250–3300 m on the eastern Andean slope in Bolivia.

Blechnum repens M. Kessler & A.R. Sm., *sp. nov.* TYPE.—Bolivia. **La Paz:** Prov. Nor Yungas, Estación Biológica de Tunquini, Bajo Hornuni, senda del campo de Don Pedro al camino de la mina, $16^{\circ}12'S$, $67^{\circ}53'W$, 2200 m, 16 August 2000, *Jimenez 453* (holotype: LPB). **Fig. 2, G–I.**

Unicum in genere *Blechno* rhizomatibus gracilibus, 3–4 mm latis, nigribus, longe prostratis pinnisque maximam partem liberis.

Epiphytic; rhizomes long-creeping, 3–4 mm thick, lustrous red-black, moderately scaly, scales $4\text{--}5 \times 0.8\text{--}1.4$ mm, linear to lanceolate, shiny, orange- to red-brown with slightly paler margins, margins subentire to remotely denticulate; fertile leaves unknown; sterile leaves to 75 cm long;

petioles ca. 45 cm long and to 1.5 mm in diameter, dark reddish brown, sparsely scaly, scales similar to those of the rhizomes but smaller; sterile laminae to ca. 30 × 15 cm, deltate, 1-pinnate, distal two pinna pairs basally somewhat adnate; sterile pinnae 7–9 pairs, to 8 cm × 16 mm, the proximal pinnae the longest, lanceolate with elongate, falcate apices, margins finely serrate, very narrowly cartilaginous, not revolute; aerophores tuberculiform; rachises dark reddish brown, grooved adaxially, sparsely scaly, the scales fibrillose, 0.2–1 mm long, orange; costae stramineous, slightly raised on both sides, basally with a few scales resembling the rachis scales; laminar tissue chartaceous, glabrous, drying olive green, slightly pale abaxially than adaxially; veins mostly 1-forked, impressed adaxially, raised abaxially, ending in small hydathodes.

This striking species has slender, 3–4 mm wide, blackish, long-creeping rhizomes unlike most other species of *Blechnum*. We lack fertile material, but the laminar aspect and the scale characters suggest that it belongs in sect. *Parablechnum*. It is perhaps closest to *B. pazense* but that species has erect to short-creeping, 2–3 cm thick rhizomes, and ca. 40 pinna pairs (vs. 7–9 pairs in *B. repens*). Interestingly, another epiphytic species of *Blechnum* with blackish, creeping rhizomes, *B. anthracinum* R.C. Moran, has recently been described from Cotapata, about 10 km south of the type locality of *B. repens* (Moran, 1992). Despite the apparent similarity in the rhizome characters, *B. anthracinum* is not closely related to *B. repens*, belonging to the species group of *B. occidentale*. It has monomorphic sterile and fertile leaves, fully adnate pinnae, and different scale characters. The apparently independent, convergent evolution of two epiphytic species of *Blechnum* with blackish, creeping rhizomes at the same site is puzzling.

Blechnum smilodon M. Kessler & M. Lehnert, *sp. nov.* TYPE.—Bolivia. **La Paz:** Prov. Nor Yungas, Trocha al Valle de Coscapa, Parque Nacional Cotapata, 16°12'S, 67°53'W, 3250 m, 11 Sep 1997, *Kessler 11814* (holotype: GOET; isotypes: LPB, UC). **Fig. 2, M–O.**

Differt a *Blechno stipitellato* (Sodirol) C. Chr. statura minore (frondibus usque 90 × 13 cm vs. 120 × 22 cm), pinnis creberioribus per fronde (40–55 vs. 20–40 iugis), venis complanis vel parce prominentibus (vs. immersis), squamis costarum rhachidumque magis ciliatis.

Terrestrial; rhizomes stout, erect, ca. 3 cm in diameter including petiole bases, scales 8–12 × 1.5–2 mm, lanceolate, translucent, blackish to reddish brown with slightly paler marginal areas, cells elongate, margins irregularly dentate; sterile leaves to 90 × 13 cm, erect; petioles to 45 cm × 0.6 cm, dark red-brown with atropurpureous bases, sparsely scaly (scales often abraded), basal scales similar to those of rhizomes; fertile blades unknown; sterile blades lanceolate, 1-pinnate, each with an abruptly reduced base and gradually reduced apex; pinnae ca. 40–55 pairs, to 7.5 cm × 9 mm, proximally deflexed, at midblade oriented at roughly 90° to the rachis, distally slightly ascending, the longest pinnae located in the proximal third of the blade, these ca. 60–80%

as long as the longest ones, petiolulate (0.5 mm), slightly falcate, apices acuminate, margins narrowly hyaline, serrulate, slightly to strongly revolute; aerophores tuberculiform; rachises atropurpureous, reddish brown or stramineous, adaxially grooved, densely scaly, the scales of two types, one $3\text{--}7 \times 0.2\text{--}0.8$ mm, lanceolate, spreading, translucent yellowish brown with irregular median lines of dark red-brown to blackish cells, the margins setose, the other $0.2\text{--}2 \times 0.1\text{--}0.8$ mm, ovate to broadly lanceolate, appressed, yellowish to dark brown, setose, with the setae about as wide as the scale body; costae stramineous, adaxially grooved, on both sides bearing sparse scales resembling the smaller rachis scales; blade tissue thinly coriaceous, drying olive green on both sides, adaxially glabrous, abaxially with scattered, tiny scales on the veins, the scales $0.05\text{--}0.2 \times 0.05 \times 0.2$ mm, arachnoid, appressed, pale to medium brown; veins simple, flush or slightly raised on both sides, ending in small hydathodes.

PARATYPES.—Bolivia. **Cochabamba:** Prov. Ayopaya, comunidad Pampa Grande, sendero a Incacasani Grande, $16^{\circ}40'S$, $66^{\circ}28'W$, 3240 m, 18 September 2002, *Jimenez 1679* (GOET, LPB, UC); Prov. Chapare, ca. 8 km al N de Maycamayu, ca. a 70 km de Sacaba, $17^{\circ}12'S$, $65^{\circ}57'W$, 3350 m, 08 December 1991, *Kessler 2917* (LPB). **La Paz:** Prov. Nor Yungas, Estación Biológica de Tunquini, senda nueva del camino de la mina (curva al lado oeste) al pantanón, $16^{\circ}11'S$, $67^{\circ}53'W$, 3000 m, 14 September 2000, *Bach 1038* (GOET, LPB); same locality, 13 July 2002, *Bach 1839* (GOET, LPB, UC); Prov. Nor Yungas, Estación Biológica de Tunquini, Bajo Hornuni, senda del campo de Don Pedro al camino de la mina, $16^{\circ}11'S$, $67^{\circ}53'W$, 2550 m, 17 August 2000, *Jimenez 474* (GOET, LPB); Prov. Murillo, valle de Zongo aprox. 15 km desde la cumbre, $16^{\circ}9'S$, $68^{\circ}7'W$, 3150 m, 04 July 1979, *Beck 1126* (LPB).

The name, taken from the sabre-toothed lion, alludes to the strongly dentate scales of the species.

The specimens placed here have previously been determined as *Blechnum stipitellatum* (Sodirol) C. Chr., and the range of that species was accordingly indicated as including Bolivia by Tryon & Stolze (1993). Recent field experience with both typical *B. stipitellatum* in Ecuador and the Bolivian plants, and study of type material of *B. stipitellatum* has, however, convinced us that two different and actually quite distinct species are involved. *Blechnum smilodon* differs from *B. stipitellatum* mainly in its smaller size (leaves to 90×13 cm vs. to 120×22 cm), higher number of pinnae per blade (40–55 vs. 20–40 pairs), flush or prominulous (vs. immersed) veins, and much more strongly dentate rachis and costal scales. *Blechnum smilodon* is known only from Bolivia, where it is fairly locally common at the humid timberline ecotone and less commonly found in cloud forests at 2500–3350 m.

True *B. stipitellatum* (syn.: *B. rubicundum* Hieron.) is most similar to *B. lima* Rosenst., from which it differs primarily in blackish to reddish brown (vs. tan) scales on the rhizomes, petioles, rachises, and costae, and somewhat less deeply sunken veins. These two species appear to replace each other geographically, with *B. lima* being known only from Bolivia, and *B.*

stipitellatum found from southern Peru north to Colombia. Previous reports of *B. lima* from Ecuador (Jørgensen and León Yanez, 1999) are based on misidentified material of *B. stipitellatum*.

Blechnum squamatum M. Kessler & A.R. Sm., *sp. nov.* TYPE.—Bolivia, Cochabamba, Carrasco, 94 km antigua carretera Cochabamba-Villa Tunari, 17°08'S, 65°38'W, 3500 m, 28 June 1996, *Kessler 6790* (holotype: UC; isotypes: GOET, LPB). **Fig. 1, N–Q.**

Differt a *Blechno cordato* (Desv.) Hieron. squamis costalibus valde majoribus, squamis rhachidium densioribus, majoribus partimque bicoloribus, aerophorisque majoribus.

Terrestrial; rhizomes erect, 15+ cm tall, ca. 10–20 cm in diameter including petiole bases, scales 8–14 × 2–24.5 mm, lanceolate, pale orangish brown, on some specimens with darker centers, margins entire or very slightly and remotely denticulate; sterile leaves to ca. 100 × 30 cm, erect; petioles to 50 cm long and 4 mm thick, proximally reddish brown, distally stramineous, moderately scaly (scales often abraded), scales of two types, one similar to those of rhizomes, but averaging somewhat smaller, the other 0.2–1.2 × 0.2–0.9 mm, roughly ovate to broadly lanceolate, appressed, pale, ciliate; sterile laminae broadly lanceolate, 1-pinnate, each with a rather abruptly reduced base and gradually reduced apex with a conform apical pinna; pinnae ca. 15–18 pairs, to 21 × 2.5 cm, ca. 70° to the rachises, the longest about a third from the base of the laminae, the proximal pinnae ca. 80% as long as the longest ones, petiolulate (3–5 mm), falcate, apices long-acuminate and serrulate, margins narrowly hyaline, entire, flat; fertile leaves known only from fragments; pinnae to 9 cm × 4 mm, linear, thicker-textured and drying of darker color than the sterile pinnae; sori covering the entire pinnae except the distal 1–3 mm; indusia dark brown, entire but erose after opening; rachises pale reddish brown to straw-coloured, adaxially grooved, moderately to densely scaly, scales similar to those of the petioles, but smaller, with partly fibrillose and arachnoid scales; aerophores at pinna bases dark reddish brown, peg-like, 1–5 mm long and 1–2 mm in diameter; costae reddish brown to straw-coloured, adaxially grooved, glabrous, abaxially with spreading scales 1–3.5 × 0.4–1.7 mm, triangular to lanceolate with cordate to truncate bases, margins denticulate to ciliate, pale orangish brown, larger scales often with dark reddish brown centers; laminar tissue chartaceous, drying dark olive green adaxially and pale olive green abaxially, adaxially glabrous, abaxially with scattered, small scales on the veins, the scales 0.05–1 × 0.05 × 0.5 mm, arachnoid to triangular, appressed, pale brown; veins simple or 1-forked, slightly immersed adaxially, ending in small hydathodes.

PARATYPE.—Bolivia. **La Paz:** Prov. Saavedra, Charazani, Richtung Carijana, 2600 m, 17 January 1994, *Herzog 438* (LPB); Prov. Caranavi, Serranía Bellavista, 47 km Caranavi a Sapecho, 15°39'S, 67°28'W, 1150 m, 31 August 1997, *Kessler 11661* (LPB, UC).

This species differs from *B. cordatum* in having much larger costal scales, much denser, larger and partly bicolorous rachis scales, and larger aerophores. *Blechnum cordatum* is a highly variable species with respect to size, number and shape of pinnae, and scale color and density, and presumably comprises a species complex. We have been unable to subdivide this complex in any meaningful way, with the exception of the most distinct form, which is described here. *Kessler 11661* differs from the type in having uniformly tan costal scales and relatively small (1 mm vs. 2 mm diameter) aerophores. More material is needed to evaluate the variability of this species.

Blechnum squamatum appears to be uncommon in humid montane forests at 1150–3500 m.

Blechnum vallegrandense M. Kessler & A.R. Sm., *sp. nov.* TYPE.—Bolivia, Depto. Santa Cruz, Prov. Valle Grande, 13 km de Loma Larga a Valle Grande, 18°39'S, 63°55'W, 2300 m, *Kessler 6474* (holotype: UC; isotypes: GOET, LPB). **Fig. 2, D–F.**

Differt a *Blechno mochaene* Kunkel var. *squamipede* (Hieron.) de la Sota frondibus sterilibus petiolos deficientibus, frondibus valde brevioribus, squamis rhizomatum atrorufescentibus.

Terrestrial; rhizomes erect, stout, ca. 1 cm in diameter including petiole bases, scales 2–3.5 × 0.8–1.3 mm, lanceolate, subclathrate, dark red-brown, entire; sterile leaves to 11.5 cm × 17 mm, erect, lacking petioles, sterile laminae lanceolate, pinnatisect with a slightly elongate apical pinna; sterile pinnae 15–17 pairs, to 10 × 4 mm, at ca. 65–70° to the rachis, the longest about 2/3 from the base of the laminae, the proximal pinnae ca. 15% as long as the longest ones, broadly adnate, slightly falcate, apices obtuse to slightly acuminate, margins with one row of hyaline cells forming a very finely serrulate margin, sometimes slightly revolute; apical pinna to 10 × 5 mm, triangular in outline, confluent at the base to one or two distalmost pinnae, apex subacute; rachises stramineous, grooved adaxially, glabrous; costae greenish to stramineous; laminar tissue fleshy, drying olive green on both sides, glabrous; veins ill-defined, mostly simple, partly 1-forked, ending in small hydathodes; fertile leaves to 16 cm × 14 mm, erect, petioles to 15 mm, proximally with 4–5 pairs of greatly reduced, broadly triangular, winglike sterile pinnae, distally the laminae lanceolate, with an elongate apical pinna; fertile pinnae 11–12 pairs, to 11 × 1.2 mm (excluding protruding indusia), oriented at ca. 55–65° to the rachises, broadly adnate, linear, falcate, apices acuminate, margins with one row of hyaline cells, drying olive green on both sides, glabrous, the fertile apical pinna to 12 × 1.2 mm, linear; rachises and costae as on sterile leaves; sori covering the entire pinnae except the apical 0.8–1.5 mm; indusia to 0.8 mm wide, dull brown, erose, spreading and extending beyond laminar tissue at maturity.

With its dimorphic sterile and fertile leaves, short-creeping to erect, stoloniferous rhizomes, adnate pinnae, and concolorous rhizome scales this species belongs to the species group of *B. penna-marina* (Poir.) Kuhn and *B.*

divergens (Kunze) Mett. It is most similar to *Blechnum squamipes* (Hieron.) M. Kessler & A.R. Sm. but differs by lacking petioles on the sterile leaves, having much smaller leaves, and by the dark red-brown rhizome scales. The type specimen of *B. vallegrandense* was originally identified as the Chilean species *B. blechnoides* (Bory) Keyserl. by Smith *et al.* (1999), but *B. vallegrandense* is much smaller, lacks petioles on the sterile leaves, and has thinner-textured blades. Species related to *B. blechnoides* and *B. mochaenum* Kunkel constitute a complex that is in need of detailed monographic study.

NEW COMBINATIONS

The following two taxa were originally described as varieties, but we consider them to be distinct at species rank:

Blechnum gracilipes (Rosenst.) M. Kessler & A.R. Sm., ***comb. nov.*** – *Blechnum blechnoides* Keyserl. var. *gracilipes* Rosenst., Repert. Spec. Nov. Regni Veg. 9: 343. 1911.

Endemic to Bolivia; saxicolous in humid montane forests at 700–2200 m.

Blechnum squamipes (Hieron.) M. Kessler & A.R. Sm., ***comb. nov.*** – *Blechnum lanceolatum* (R. Br.) J. W. Sturm var. *squamipes* Hieron., Bot. Jahrb. Syst. 22: 381. 1896.

Southern Bolivia and northwestern Argentina; humid forests at 1850–2300 m.

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